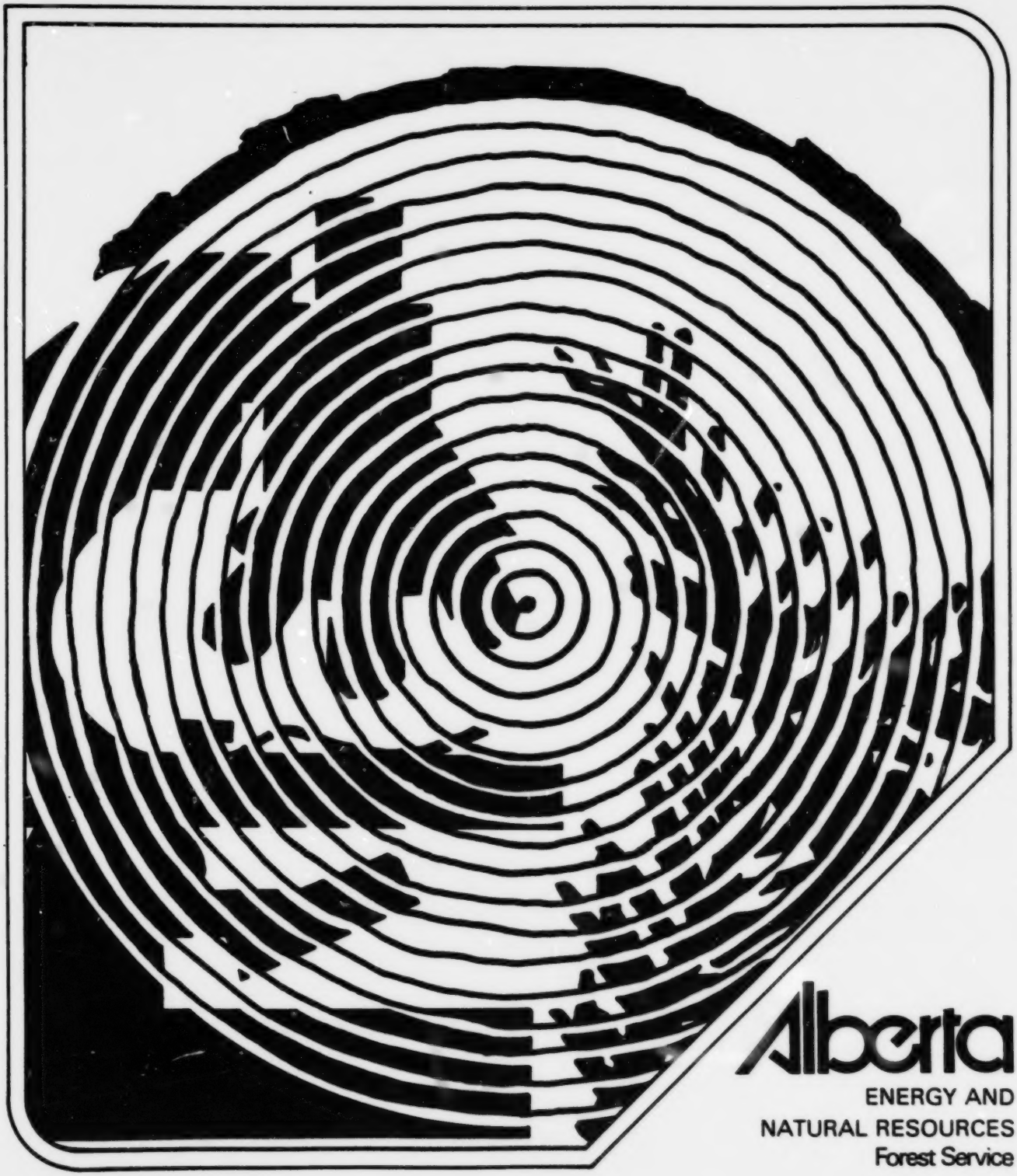
Forest Development Research Trust Fund

Annual Report 1984–85



Alberta

ENERGY AND
NATURAL RESOURCES
Forest Service

FOREST DEVELOPMENT

RESEARCH TRUST FUND

ANNUAL REPORT

1984-85

1985
Edmonton

Alberta
ENERGY AND
NATURAL RESOURCES
Forest Service

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Alberta
ENERGY AND
NATURAL RESOURCES
Forest Research Branch

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The Hon. John Zaozirny
Minister of Energy and Natural Resources
319 Legislature Building
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Sir:

I have the honor to submit the Annual Report of the Forest Development Research Trust Fund for the fiscal year ending March 31, 1985.

Respectfully submitted,

J. Soos, Chairman
Advisory Council
Forest Development Research
Trust Fund

FOREWORD

Two new and six renewed studies were financed by the Forest Development Research Trust Fund during the 1984/85 fiscal year.

Four studies were completed on a wide range of topics, such as the variation of anatomical and physical properties of aspen, the classification of peatland based on growth response to drainage, the economic consequences of forest land losses to non-timber uses and early screening for inherently superior conifers.

The first new study was evaluating the effect of far-red light treatment on the growth characteristics of lodgepole pine and balsam poplar seedlings. Results indicated that both species have shown considerable response to the treatment in terms of increased total dry weight. This technique could well be applied to container seedling production. The second study dealt with the identification of critical habitats for wapiti after logging and reclamation. This study provides an opportunity for the identification of some forestry-wildlife interactions and it is co-funded by the Recreation, Parks and Wildlife Foundation.

All renewed studies made good progress. Several important discoveries were made, such as the identification of active compound in Scylatidium uredinicola, a hyperparasite of western gall rust, the application of the trap log method for the identification of various biological species of Armillaria, and the development of a rapid and economic production technique for pheromones.

It was a pleasure to observe that the two PhD and two MSc theses based on three studies were accepted and successfully defended.

It is increasingly evident that the financial support provided by the Forest Development Research Trust Fund is fulfilling the original goals of the Fund in terms of the development of new technology, the advancement of science and the education of new scientists.

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COMPLETED PROJECTS

VARIATION OF ANATOMICAL AND PHYSICAL PROPERTIES

OF ASPEN IN ALBERTA

INVESTIGATOR: Dr. M.M. Micko, University of Alberta

DRAINAGE GROWTH CLASSIFICATION SYSTEM

INVESTIGATOR: Dr. A.K. Hellum, University of Alberta

ECONOMIC CONSEQUENCES OF FOREST LAND LOSSES TO

NON-TIMBER USES IN ALBERTA

WITH PARTICULAR REFERENCE TO AGRICULTURE

INVESTIGATOR: Dr. W.E. Phillips, University of Alberta

EARLY SCREENING FOR INHERENTLY SUPERIOR GROWTH

IN CONIFERS: PRELIMINARY INVESTIGATION

INVESTIGATOR: Dr. R.P. Pharis, University of Calgary

NEW PROJECTS

EFFECT OF LIGHT QUALITY ON SEEDLING GROWTH AND SURVIVAL

INVESTIGATOR: Dr. J. Hoddinott, University of Alberta

DURATION: One Year

OBJECTIVES: To assess the effect of far-red light treatment on the growth characteristics of lodgepole pine and balsam poplar seedlings.

PROGRESS: Growth analysis of seedlings indicated that growth rates were higher in terms of internodal extension, and dry matter production including needles, stem and root, under far-red light treatment. Far-red light treatment, as a result of higher photosynthetic efficiency, increased the total dry weight of three-month-old lodgepole pine seedlings by 229%; stem dry weight by 459%; and root dry weight by 334%. The total dry weight of three-month-old poplar seedlings was increased by 52%; the stem dry weight by 215%; and root dry weight by 107%. More importantly, the root/shoot ratios of both species were slightly increased under supplemental far-red light conditions, indicating the possibility of better seedling survival and growth.

FUTURE WORK: Detailed data analysis and preparation of publication will be carried out.

CRITICAL RESOURCES OF WAPITI IN THE BOREAL FOOTHILLS REGION OF ALBERTA

INVESTIGATORS: Dr. R.J. Hudson, University of Alberta
Mr. C.D. Olsen, University of Alberta

DURATION: Three years

OBJECTIVES: To determine the seasonal ecological strategies of boreal wapiti with emphasis on the description of occupational patterns and foraging behavior; to identify critical habitat and forage resources and to assess the contribution of reclamation habitat to the seasonal nutrient cycle.

PROGRESS: Camp was established, trap sites were constructed and all necessary equipment such as radio collars and sufficient immobilization drugs were obtained. Food habits of wapiti were observed and forage samples collected for identification. Representative habitat sites were identified during summer movement. Nutritional and digestibility studies were carried out at the University Farm.

FUTURE WORK: Winter trapping will be carried out to capture elk. Opportunities and systematic track surveys will be conducted including foraging, food habitat and movement data. Habitat descriptions will be refined; forage availability study and fecal pellet collections will continue.

RENEWED PROJECTS

VARIATION OF ANATOMICAL AND PHYSICAL PROPERTIES OF ASPEN IN ALBERTA

INVESTIGATOR: Dr. M.M. Micko, University of Alberta

DURATION: Five years

OBJECTIVES: To establish basic information about the variation of wood specific gravity and fibre length, growth rate and decay in naturally occurring aspen clones in Alberta.

PROGRESS: Ten aspen clones from the Edson area were studied for their wood quality characteristics. It was found that tree taper and roundness was quite uniform between various clones. Considerable differences, however, were observed in growth rate, relative density and fibre length between clones. Relative density showed a characteristic decreasing pattern from the pith toward the bark, reaching a minimum between 15 and 20 years and increasing again beyond that age. Relative density was higher at the base and top of the tree; the middle portion of the tree exhibited the lowest density.

The observed range of density and fibre length between individual clones were 0.32 to 0.41 and 0.934 to 1.177 mm respectively.

FUTURE WORK: The study is completed and a report is prepared.

ISOLATION AND CHARACTERIZATION OF ANTIFUNGAL SUBSTANCE(S) PRODUCED BY *SCYTALIDIUM UREDINICOLA*, A HYPERPARASITE OF *ENDOCRONARTIUM HARKNESSII*, WESTERN GALL RUST

INVESTIGATOR: Dr. M.A. Pickard, University of Alberta

DURATION: Four years

OBJECTIVES: To determine the ability of compound(s) produced by *S. uredinicola* to inhibit the germination of *E. harknessii* spores *in vitro*, and to isolate and purify the active compounds. The effectiveness of the compounds will be tested *in vivo* against western gall rust on lodgepole and jack pine as a means of biological control.

PROGRESS: *S. uredinicola* strains C677 and 4149 were grown in 2% malt extract medium, then filtered, concentrated and extracted with chloroform, yielding a viscous brown residue. The extract was subsequently purified and metabolites identified by mass spectrum analysis with computer library matching. Confirmation was made by comparison with an authentic sample of 3-hydroxy-2-methyl-4-pyrone, or Maltol. Maltol is a known plant metabolite occurring between proteins and carbohydrates at elevated temperatures, having antifungal and antibacterial properties.

FUTURE WORK: Antifungal properties of Maltol will be tested on western gall rust and other fungi. Maltol content of needles collected from western gall rust resistant and susceptible lodgepole pine trees will be determined.

PATHOLOGICAL AND PHYTOCHEMICAL STUDIES OF ARMILLARIA ROOT ROT OF INTENSIVELY MANAGED YOUNG CONIFEROUS FORESTS IN ALBERTA

INVESTIGATORS: Dr. Y. Hiratsuka, University of Alberta
Dr. W.A. Ayer, University of Alberta

DURATION: Three years

OBJECTIVES: To determine whether the weakening of the tree is necessary for disease expressions; to identify the possibility of a relationship between pathogen and disease distribution in several selective sites; to study the pathogenesis of the disease; and to identify biologically active metabolites produced by the pathogen.

PROGRESS: Three sites were selected in the upper boreal subzone near Hinton. Trees growing on one site were infected with Armillaria, but no evidence of the disease was found at the other two sites. Sharpened trembling aspen poles were pounded into the ground on each site. All poles were removed and examined for the presence of Armillaria root rot. Isolates from positive trap logs and diseased trees were found to be the same form of Armillaria. None of the trap logs from the other two sites was colonized by the fungus. This study indicates that the trap log method appears to be a promising technique for the detection of Armillaria fungus in forest soils. A PhD thesis based on the results of this study was prepared and successfully defended.

FUTURE WORK: To compile comprehensive distribution records of Armillaria root rot in Alberta according to biological species of pathogen complex by host tree species and forest types. Relative pathogenecity and host preference of each biological species will be determined and the morphological basis of the species identified will be described.

CORRELATION OF GLOBAL AND NET RADIATION WITH EVAPOTRANSPIRATION ON A FORESTED WETLAND SITE IN NORTHERN ALBERTA

INVESTIGATOR: Dr. R.L. Rothwell, University of Alberta

DURATION: Three years

OBJECTIVES: To establish a set of empirical relationships between total global shortwave radiation and water table fluctuations and net radiation and evapotranspiration for a forested wetland site. To use these relationships and attendant data as a basis for evaluation of existing methods for estimating evaporation from wetlands and/or develop a local method based on readily-available climatic data.

PROGRESS: Data collection regarding daily solar radiation and daily net radiation were completed. Sampling program for climatic and groundwater parameters was continued and completed.

FUTURE WORK: Data analysis and preparation of final report will be completed.

FIELD AND GREENHOUSE PERFORMANCE OF WHITE SPRUCE EDAPHIC ECOTYPES

INVESTIGATORS: Dr. D.J. Pluth, University of Alberta
Dr. B.P. Dancik, University of Alberta

DURATION: Four years

OBJECTIVES: To determine greenhouse survival and growth of white spruce seedling populations collected from areas having different calcium concentrations.

PROGRESS: Soil, needle and growing medium analyses were carried out. Various progenies were grown in hydroponic sand cultures with controlled solution composition. Preparation of MSc thesis in progress.

FUTURE WORK: Data analysis and preparation of a MSc thesis will be completed.

CHEMICAL COMMUNICATION (PHEROMONE) SYSTEM OF MOUNTAIN PINE BEETLE AND APPLICATION OF THE NATURAL PHEROMONE AND SYNTHETIC ANALOGS IN BEETLE MANAGEMENT

INVESTIGATORS: Dr. H. Wieser, University of Calgary
Dr. E.A. Dixon, University of Calgary

OBJECTIVES: To evaluate the response of beetles to various structurally-related synthetic analogs of beetle-produced compound; to determine if any analogs tested provide a more potent attractant; to determine whether sex ratio shifts in favor of male or female; and to find relationship between molecular structure and attractive response for beetles in the field.

PROGRESS: It was found that the exo-5,7-dimethyl, e57D, analog when used in conjunction with trans-verbenol and myrcene compounds in baited traps for capturing mountain pine beetles in lodgepole stands was surperior to the natural pheromone component, exo-brevicomin eB. Under near epidemic conditions, however, eB was more effective than e57D when used as tree baiting in lodgepole pine stands. The method of tree baiting to monitor beetle populations works very well in low-level populations. The pheromone formulations which have proven successful for lodgepole were not effective for limber pine. A very promising route has been discovered for the synthesis of e57D which can be adopted for commercial scale production.

FUTURE WORK: Experiments established in 1984 will be continued and concluded in terms of definition and quantification of release rates of exo-brevicomin and the synthetic substitute of exo-5, 7-dimethyl analog. Identification and isolation of chemicals contained in the body parts of mountain pine beetles grown in limber pine will be carried out and bait formulations for trapping or tree baiting in limber pine will be prepared.

FOREST DEVELOPMENT RESEARCH TRUST FUND

FINANCIAL STATEMENTS

MARCH 31, 1985

Auditor's Report

Balance Sheet

Statement of Revenue, Expenditure and Unexpended Funds

Notes to the Financial Statements

ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL

AUDITOR'S REPORT

To the Council of the Forest Development
Research Trust Fund

I have examined the balance sheet of the Forest Development Research Trust Fund as at March 31, 1985 and the statement of revenue, expenditure and unexpended funds for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1985 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

F.C.A.
Auditor General

Edmonton, Alberta
July 17, 1985

FOREST DEVELOPMENT RESEARCH TRUST FUND

BALANCE SHEET

AS AT MARCH 31, 1985

	1985	1984
ASSETS		
Current:		
Cash	$191,572	$220,498
LIABILITIES		
Current:		
Research grants payable	$ 64,871	$ 76,336
Accounts payable	575	575
Unexpended funds	126,126	143,587
	$191,572	$220,498

The accompanying notes are part of these financial statements.

FOREST DEVELOPMENT RESEARCH TRUST FUND

STATEMENT OF REVENUE, EXPENDITURE AND UNEXPENDED FUNDS

FOR THE YEAR ENDED MARCH 31, 1985

	1985	1984
REVENUE		
Contributions by the Province of Alberta (Note 3)	$100,000	$100,000
Interest	22,812	22,368
Donations	-	115
	122,812	122,483
EXPENDITURE		
Research grants	139,698	190,693
Council members' fees and expenses	575	575
	140,273	191,268
Excess of expenditure over revenue	17,461	68,785
Unexpended funds at beginning of year	143,587	212,372
Unexpended funds at end of year	$126,126	$143,587

FOREST DEVELOPMENT RESEARCH TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS

MARCH 31, 1985

Note 1 Authority

The Forest Development Research Trust Fund operates under the authority of the Forest Development Research Trust Fund Act, Chapter F-13, Revised Statutes of Alberta 1980.

Note 2 Significant Accounting Policies and Reporting Practices

Administration Expenses

Salaries, accommodation, and other overhead costs incurred in the administration of the Fund have been paid by the Province of Alberta and are not reflected in these financial statements.

Changes in Financial Position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Contributions by the Province of Alberta

The Department of Energy and Natural Resources provides contributions annually for research and council members' expenditure incurred by the Fund. Where expenditure is less than the contributions in any given year, the balance is repayable to the General Revenue Fund of the Province.

Note 4 Commitments

As at March 31, 1985, the Fund had research grant commitments totalling $136,869 (1984 $140,435).

Note 5 Approval of Financial Statements

These financial statements were approved by management.